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10/520,816

01/07/2005

Susumu Matsumoto

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06/14/2006

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EXAMINER

MATTHEWS, COLLEEN ANN

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 06/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|---------------------------------|----------------------------------|--|
| Office Action Summary | Application No. 10/520,816 | Applicant(s) MATSUMOTO ET AL. | |
| | Examiner Colleen A. Matthews | Art Unit 2811 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 May 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) 21-43 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's election of claims 1-20 in the reply filed on May 1, 2006 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. **Claims 1, 3-6, and 8-15** are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Pub. No. 2003/0001273 to Steiner et al. (Steiner).

4. **Regarding claim 1**, Steiner discloses an electronic device comprising: a low dielectric constant (42, paragraph 19 lines 20-21) film having a hole (90), a nitrogen-non-containing insulating film (36, paragraph 22) formed under the low dielectric constant film, and a nitrogen-containing insulating film (30, paragraph 20 lines 4-8) formed under the nitrogen-non-containing insulating film.

Art Unit: 2811

5. **Regarding claim 3**, Steiner discloses the device of claim 1, where the lower surface of the low dielectric constant film (42) is in contact with the upper surface of the nitrogen-non-containing insulating film (36).

6. **Regarding claim 6**, Steiner discloses an electronic device comprising: a low dielectric constant film (42, paragraph 19 lines 20-21) having a hole (90), a nitrogen-non-containing insulating film (48, paragraph 22) formed over the low dielectric constant film, and a nitrogen-containing insulating film (54) formed over the nitrogen-non-containing insulating film.

7. **Regarding claim 11**, Steiner discloses an electronic device comprising: a low dielectric constant film (42, paragraph 19 lines 20-21) having a hole (90), a first nitrogen-non-containing insulating film (36, paragraph 22) formed under the low dielectric constant film, a second nitrogen-non-containing insulating film (48, paragraph 22) formed over the low dielectric constant film, where the hole passes through the first nitrogen-non-containing insulating film and a trench (82), which is connected with the hole, is formed in the second nitrogen-non-containing insulating film and at least an upper portion of the low dielectric constant film.

8. **Regarding claims 4-5, 9-10 and 14-15**, Steiner discloses the device of claims 1, 6 and 11, where the low dielectric constant film is a carbon-containing silicon oxide film or a porous film (paragraph 19 lines 20-21). Steiner further discloses the carbon-containing silicon oxide film as a SiOC film (paragraph 19 lines 20-21).

Art Unit: 2811

9. **Regarding claim 8**, Steiner discloses the device of claim 6, where the upper surface of the low dielectric constant film (42) is in contact with the lower surface of the nitrogen-non-containing insulating film (48).

10. **Regarding claim 12**, Steiner discloses the device of claim 11, where the lower surface of the low dielectric constant film (42) is in contact with the upper surface of the first nitrogen-non-containing insulating film (36).

11. **Regarding claim 13**, Steiner discloses the device of claim 11, where the upper surface of the low dielectric constant film (42) is in contact with the lower surface of the second nitrogen-non-containing insulating film (48).

12. **Claims 16 and 18** are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Pub. No. 2005/0098896 to Huang et al. (Huang).

13. **Regarding claim 16**, Huang discloses an electronic device comprising: a low dielectric constant film (Fig 3 element 306a) having a hole (346a), and a low density insulating film (308a) having a film density of 1.3 g/cm or lower (paragraph 24 lines 16-21) and formed over the low dielectric constant film.

14. **Regarding claim 18**, Huang discloses the device of claim 16, further comprising a nitrogen-containing insulating film (Fig 3 element 304a, paragraph 37 lines 1-3 and paragraph 20 lines 4-5) formed under the low dielectric constant film.

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. **Claim 2** is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pub. No. 2003/0001273 to Steiner et al. (Steiner) in view of applicant's Admitted Prior Art (APA).

17. **Regarding claim 2**, Steiner discloses the device of claim 1, where the hole passes through the nitrogen-non-containing insulating film and the nitrogen-containing insulating film. Steiner lacks disclosing the device further including a lower-level interconnect which is located under the hole and connected with the hole, and the upper surface of the lower-level interconnect, except for a region in which the lower-level interconnect is connected with the hole, is covered with the nitrogen containing insulating film.

The APA discloses a device including a lower-level interconnect (2) which is located under the hole (7) and connected with the hole, and the upper surface of the lower-level interconnect, except for a region in which the lower-level interconnect is connected with the hole, is covered with the insulating film (3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Steiner to include a lower-level interconnect under the hole as in the APA in order to provide electrical connection to other circuitry.

Art Unit: 2811

18. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pub. No. 2003/0001273 to Steiner et al. (Steiner) in view of U.S. Pub. No. 2002/0102779 to Yang.

19. **Regarding claim 7**, Steiner discloses the device of claim 6 where a trench (82) which is connected with the hole (90) is formed in the nitrogen-containing insulating film, the nitrogen-non-containing insulating film, and at least an upper portion of the low dielectric constant film. Steiner lacks disclosing the nitrogen-containing insulating film is an anti-reflection film.

Yang teaches a nitrogen-containing insulating film (Fig 2F element 210, paragraph 21) as an anti-reflection film formed over a dielectric film. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Steiner to have the nitrogen-containing insulating film as an anti-reflection film as in Yang in order to limit reflection during patterning.

20. **Claims 17, 19 and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pub. No. 2005/0098896 to Huang et al. (Huang) in view of U.S. Pub. No. 2003/0001273 to Steiner et al. (Steiner).

21. **Regarding claim 17**, Huang discloses the device of claim 16, as above. Huang lacks teaching the low density insulating film containing Nitrogen. Steiner teaches an insulating film containing Nitrogen. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Huang to have the low density

Art Unit: 2811

insulating film contain Nitrogen as in Steiner because well known etch chemistries can be used with nitrogen layers.

22. **Regarding claims 19-20**, Huang discloses the device of claim 16, as above, Huang lacks teaching the low dielectric constant film as carbon-containing silicon oxide film, where it is a SiOC film, or a porous film. Steiner teaches a low dielectric constant film as SiOC. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Huang to have the low dielectric constant film as SiOC as in Steiner in order to provide device performance improvements such as reducing propagation delay and therefore improving speed.

Conclusion

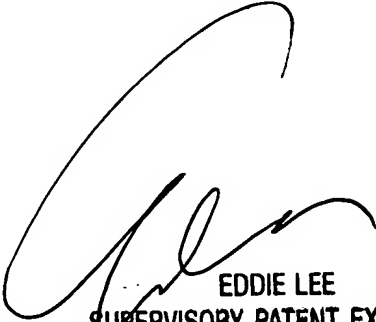
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colleen A. Matthews whose telephone number is 571-272-1667. The examiner can normally be reached on Monday - Friday 8AM-4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2811

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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06/08/2006



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